

# Preferences for sustainable, liveable and resilient neighbourhoods and homes: A case of Canberra, Australia

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## ABSTRACT

Australian households are faced with rising energy costs and increasing occurrences of extreme weather events, such as hail storms and heat waves, due to the effect of climate change and influence of energy policies. Consequently, there has been increasing effort into designing homes and neighbourhoods that have built-in or retrofitted sustainable features such as solar panels to ensure that households are able to secure their own supply of electricity in times of shortages, as well as save on utility bills. The objective of this paper is to understand people's preferences for characteristics of sustainable neighbourhoods and homes using a case study of 300 residents in Canberra, Australia. Findings from this survey suggest that housing affordability, energy saving designs for good temperature control, neighbourhood safety and cleanliness are the most desirable features of the neighbourhood and home across all socio-economic groups and buying intentions (i.e. investor or owner-occupier). The least preferred features are green facades (e.g. green roofs, green walls, large lawns) and communal bins rather than individual household ones. This information can be used to inform the design of future housing estates or suburb developments that want to pitch towards the 'green' consumer market.

## 1. Introduction

In the future, cities are likely to face more environmental, social, and economic shocks and stresses which are often difficult to foresee. The effect of climate change, for instance, is likely to lead to more extreme weather events, such as hail storms, floods, and heatwaves. Additionally, with the growing middle class and people's improved understanding of lifestyle impacts on the environment, homebuyers are able to demand and afford to live in homes and neighbourhoods that have low environmental impact, resilient to any environmental changes, and offer high quality living conditions. Cities can be more prepared to meet these shocks and stresses and reduce their vulnerability to such impacts, and at the same time, recover from adverse impacts soon after they occur (Burton, 2014). Consequently, there is an increasing trend to respond to these demands among property developers, and as a result town planners and governments have to come up with building and neighbourhood designs that meet these demands.

The aims of this paper are to examine the characteristics of sustainable neighbourhoods and homes, to identify the characteristics of sustainability, liveability, and resilience in neighbourhoods and homes, and to assess empirically people's preferences for particular

sustainability characteristics of neighbourhoods and homes. We anticipate that findings from this paper can inform the design of future homes and neighbourhoods, and that the information presented here can be used by government, town/city planners, architects, engineers, marketing people, and real estate agents.

For clarity, we first define sustainability, liveability and resiliency in the context of urban development, particularly around neighbourhood and home design. Although sustainability is defined as “*development that meets the needs of the present without compromising the ability of future generations to meet their own needs*” (United Nations, 1987), in the context of urban development, the definition is slightly more specific. Sustainability is the effort to “*Reduce resource use and environmental impact that is beyond typical practices, while still offering appropriate indoor environmental quality*” (Cole, 2000). This includes the effort to minimize negative environmental effects of the development, and incorporate energy efficient and water sensitive buildings and landscape designs while still complying with regulatory and cost constraints (Cole, 2000; Hostetler and Noiseux, 2010).

Liveability is defined as “*the degree to which a place supports quality of life, health and well-being*” (Lowe et al., 2015; Major Cities Unit, 2012). Hence, a liveable neighbourhood or city should be peaceful, safe,

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socially cohesive and inclusive, harmonious, attractive, affordable, high in amenity, environmentally sustainable, and easily accessible (Lowe et al., 2015). An example of a highly liveable neighbourhood is one where there is a diverse range of housing that is affordable, well-linked to public transport, provides walking and cycling infrastructure, has easy access to schools, employment, public open space, shops, health, community and social services (Lowe et al., 2015). All these qualities contribute to people's quality of life, health and well-being.

Resiliency is described as the ability of a system to absorb changes and disturbances and still maintain the same relationship between its components, or re-organize itself into a fully functioning system again (Cutter et al., 2008; Holling, 1973). According to the 100 Resilient Cities program, a resilient city is one that is able to withstand and respond to shocks and stresses. Shocks are one-off events that result in catastrophic outcomes. These events include earthquakes, floods, and bushfires. Stresses, on the other hand, are prolonged situations that “weaken the fabric of the city on a day to day or cyclical basis”. These situations are, for example, high unemployment rate, chronic food and water shortages, etc. The 100 Resilient Cities program argues that “by addressing both the shocks and the stresses, a city becomes more able to respond to adverse events, and is overall better able to deliver basic functions in both good times and bad, to all populations.”

Future cities strive to be sustainable, liveable and resilient to ensure that their citizens are living happily and healthily, in an affordable home that is cost efficient to maintain, and is resilient to any future shocks and stresses. For policy makers, land developers, builders and real estate agents, it is important to know that given the vast list of sustainable, liveable and resilient features of the neighbourhood and home, what it is that people really find important.

The objective of this paper is twofold: First, to present a comprehensive list of sustainable, liveable, and resilient features of both neighbourhoods and homes that have been rated highly by households, or shown to add value to the home from past empirical literature. To our knowledge, this is the first one of its kind to evaluate this many features (67 neighbourhood features and 38 features of the home) in a single study. Second, to assess people's preferences for characteristics of sustainable neighbourhoods and homes using an online survey of 300 residents in Canberra Australia.

## 2. Literature review

Urban resilience is reviewed in the literature due to the emergence of climate change disorders, and a rise in natural disasters. Many sets of indicators are available to gauge how well cities adapt to, and recover from a disaster, or move toward a resilient state e.g. the City Resilience Index (Arup, 2015). These indicators deal with social, economic, ecological, infrastructure, institutional, and community resilience.

Our review of literature reveals a variety of sustainable, liveable and resilient features of the neighbourhood and home that have been studied throughout the world. Some studies only focus on preferences for a single feature, while other studies focus on evaluating preferences for multiple features and attempt to rank the preferences from high to low. In this paper, we review numerous neighbourhood and home features that have been identified in the literature as relevant to sustainability, liveability or resilience of neighbourhoods or homes. We searched for papers in Web of Science, Scopus, and Google Scholar, using keywords including ‘sustainability; resilience; liveability; sustainability; green home; green building; sustainable house; house & satisfaction; and willingness to pay’. A total of 60 papers (seven on resiliency; eight on sustainability; five on liveability; 16 willingness to pay for home and neighbourhood characteristics; 17 on preferences for household and neighbourhood characteristics; and seven on post-occupancy of green buildings) that were relevant to the objective of this paper were reviewed. Table 1 provides a list of references for each topic area that have been the main focus of this research paper.

Design features of the neighbourhood and home could provide more than one benefit, making it difficult to categorize whether that feature is a sustainable, or liveable, or resilient. Consider the use of solar panels as an example. Solar panels are sustainable because they are a source of renewable energy and require zero carbon emission to produce electricity. Additionally, solar panels play a role in improving resiliency as homeowners are better prepared against any shocks from power outages, or stresses from increasing energy prices.

Table 2 presents a list of neighbourhood features from the literature under each feature type. The list identifies 67 different neighbourhood features. We groups these into six different feature types derived from the existing literature (see Burton 2014). The 67 features were

**Table 1**  
List of papers reviewed by topic area.

Resiliency	Liveability	Willingness to pay	Preferences
1. Burton (2014)	1. Lowe et al. (2015)	1. Chau, Tse, and Chung (2010)	1. Bender, Din, Favarger, Hoesli, and Laakso (1997)
2. Gunawansa and Kua (2014)	2. Marshall et al. (2014)	2. Mousavi, Khan, and Javidi (2013)	2. Leaman and Bordass (2007)
3. Cutter et al. (2008)	3. Leyden, Goldberg, and Duval (2011)	3. Hite (2009)	3. Chen, Chiang, Horng, and Lee (2011)
4. Ainuddin, Routray, and Ainuddin (2015)	4. Ahmed (2012)	4. Calcagni (2012)	4. Kyu-in and Dong-woo (2011)
5. Engle, de Bremond, Malone, and Moss (2013)	5. Raisbeck and Wardlaw (2009)	5. Hu, Geertman, and Hooimeijer (2015)	5. Wu and 吴凡 (2010)
6. Wickes, Zahnow, Taylor, and Piquero (2015)		6. Tan (2011)	6. Gilderbloom, Riggs, and Meares (2015)
7. Bozza, Asprone, and Manfredi (2015)		7. Chiu (2004)	7. Noiseux and Hostettler (2008)
<b>Sustainability</b>	<b>Post-occupancy</b>	8. Yean Yng Ling and Gunawansa (2011)	8. Zalejska-Jonsson (2012)
1. Luederitz, Lang, and Von Wehrden (2013)	1. Gill, Tierney, Pegg, and Allan (2010)	9. Hu, Geertman, and Hooimeijer (2014b)	9. Hu, Geertman, and Hooimeijer (2014a)
2. Cole (2000)	2. Leaman and Bordass (2007)	10. Torres, Greene, and Ortúzar (2013)	10. Leaman et al. (2007)
3. Choguill (2008)	3. Leaman, Thomas, and Vandenberg (2007)	11. Bowman, Thompson, and Colletti (2009)	11. White and Gatersleben (2011)
4. Braulio-Gonzalo, Bovea, and Ruá (2015)	4. Hostettler and Noiseux (2010)	12. Lo and Jim (2010)	12. Zalejska-Jonsson (2014a)
5. Ng, Cook, and Chui (2001)	5. Buys et al. (2005)	13. Yau (2012a)	13. Riccardo, Van Oel, and De Jong (2013)
6. Ahmed (2012)	6. Kyu-in and Dong-woo (2011)	14. Zalejska-Jonsson (2014b)	14. Eves and Kippes (2010)
7. Braulio-Gonzalo et al. (2015)	7. Afacan and Demirkan (2015)	15. Mandell and Wilhelmsson (2011)	15. Tan (2013)
8. Ng et al. (2001)		16. Yau (2012b)	16. Buys et al. (2005)
			17. Portney (2002)

**Table 2**

Sustainable, liveable and resilient neighbourhood features derived from the literature review and grouped by feature type.

Neighbourhood features by feature type		
<b>Social</b>		
<ul style="list-style-type: none"> <li>• primary schools</li> <li>• secondary schools</li> <li>• welfare services</li> <li>• aged care facilities</li> </ul>	<ul style="list-style-type: none"> <li>• new developments with unique characteristics to Canberra</li> <li>• a good balance of low, medium, and high – cost housing</li> <li>• choices for affordable housing</li> <li>• historical and cultural elements which give it a sense of place</li> </ul>	
<b>Neighbourhood safety</b>		
<ul style="list-style-type: none"> <li>• a fire station</li> <li>• regular police patrols</li> </ul>	<ul style="list-style-type: none"> <li>• surveillance of public parkland and green areas</li> <li>• an emergency management plan in case of a natural disaster event</li> </ul>	<ul style="list-style-type: none"> <li>• low crime rate</li> </ul>
<b>Healthy environment</b>		
<ul style="list-style-type: none"> <li>• limited sources of pollution</li> <li>• cleanliness</li> </ul>	<ul style="list-style-type: none"> <li>• fortnightly garbage collection</li> <li>• shared bins rather than bins for individual homes</li> </ul>	
<b>Economy</b>		
<ul style="list-style-type: none"> <li>• commercial establishments</li> <li>• larger retail centres</li> <li>• research and development firms nearby</li> </ul>	<ul style="list-style-type: none"> <li>• employment opportunities in the neighbourhood</li> <li>• professional, scientific, and technical services</li> <li>• a balanced ratio of large to small businesses</li> </ul>	
<b>Community</b>		
<ul style="list-style-type: none"> <li>• libraries</li> <li>• cafés</li> <li>• museums</li> <li>• community gardens</li> <li>• health services</li> <li>• street trees</li> <li>• access to local broadcast signal such as free TV and radio</li> </ul>	<ul style="list-style-type: none"> <li>• children's playground</li> <li>• child care facilities</li> <li>• psychological support facilities</li> <li>• adult education and training facilities</li> <li>• ponds, lakes and water courses</li> <li>• underground power lines</li> </ul>	<ul style="list-style-type: none"> <li>• arts and entertainment centres</li> <li>• youth playground (e.g. skate park)</li> <li>• social advocacy organisations</li> <li>• a diversity of religious organisations</li> <li>• access to NBN/transact</li> <li>• local neighbourhood shops</li> <li>• indoor recreational and sports facilities</li> </ul>
<b>Accessibility and connectedness</b>		
<ul style="list-style-type: none"> <li>• well-lit cycle lanes</li> <li>• off-road cycle paths</li> <li>• well-lit footpaths</li> <li>• on-road cycle lanes</li> <li>• good quality footpaths</li> <li>• a good presence of bus stops</li> <li>• plenty of off-street parking</li> <li>• access to public transport services</li> <li>• a well-connected footpath network</li> <li>• a well-connected cycling network</li> </ul>	<ul style="list-style-type: none"> <li>• shaded footpaths</li> <li>• good quality road surfaces</li> <li>• wide footpaths</li> <li>• places for people to socialise</li> <li>• homes that are within a short distance of public amenities</li> <li>• multiple entry points to the suburb to negate traffic congestions</li> <li>• parks and open spaces for sport and recreation</li> <li>• parks and open spaces are integrated into the urban structure</li> <li>• footpaths with access to the street network</li> <li>• different block sizes to cater for housing diversity</li> </ul>	<ul style="list-style-type: none"> <li>• special road crossings for the elderly</li> <li>• cycling routes along the street network</li> <li>• footpaths through parks and green areas</li> <li>• a street network that is easy to get around</li> </ul>

characterized independently into a single feature type by two different members of the research team.

In the same vein as neighbourhood features, it was also difficult to categorise house features as sustainable, liveable or resilient, due to a great deal of overlap. For example, a rainwater tank could be considered both 'sustainable' as it is using rainwater rather than tap water, and 'resilient' because by having rainwater tanks, household are less susceptible to the drought. Instead, we have grouped features of the home by building design, construction material, landscaping, lifestyle and comfort, green technology, and economic. Table 3 presents a list of house features from the literature under each group. Note that the features of the neighbourhood and home presented in Table 2 and Table 3 are not an exhaustive list, but are a collection of features derived from the literature reviewed for this study.

Street network design also plays an important role in neighbourhood liveability, particularly on traveling time, traveling mode choice and health. For example, Frank, Andresen, and Schmid (2004) argues that residential density (i.e. the number of households divided by land area within residential use) is significantly negatively correlated with car use, which in turn affects obesity level. Frank and colleagues suggest that people living in higher density residential areas with high street connectivity are less likely to be obese than people who live in less dense areas. In a separate study with similar findings, Marshall, Piatkowski, and Garrick (2014) found that having gridded street network designs that are compact and highly connected is correlated with lower levels of obesity, high blood pressure and heart diseases as compared to the tree-like network (see Fig. 1 for reference).

Socio-economic circumstances and environmental attitudes of individuals and households affect preferences for sustainable, liveable and resilient neighbourhoods and homes. Portney (2002), for example, demonstrated that some cities are more sustainable than others because

their residents take sustainability more seriously. Specifically, Portney showed an inverse correlation between income and taking sustainability seriously i.e. lower income people were not too concerned about sustainability. Supporting that argument, Zhang (2010) posited that home buyers will not concern themselves with environmental features of the home until they are 'more economically comfortable and considered aspects beyond the provisions of security'. Portney also found that older and more educated people are more concerned about sustainability. However, contrary to Portney's findings, Mandell and Wilhelmsson (2011) found an inverse correlation between education level and sustainable behaviour in that when education level rises, people spend less money on sustainable attributes of the home such as solar energy, triple pane windows and insulation. In a willingness to pay study for lower energy buildings and buildings with environmental certificates conducted in Sweden, Zalejska-Jonsson (2014b) found no gender effects on willingness to pay a premium for sustainable buildings. With regards to environmental attitudes, Raisbeck and Wardlaw (2009) found in their survey of Australian residents that there was a highly significant correlation between people who rate themselves as being interested in environmental issues more than others, and their likelihood to consider buying or living in an environmentally friendly home.

It is important to note that features of the home and features of the neighbourhood most likely interact with one another, and with street design, to influence people's preferences for what sort of home they desire, and in what sort of neighbourhood. However, for the purposes of the present study we treat features of homes and neighbourhoods as independent of one another. It is also important to note that there are likely many social factors involved in making some features of neighbourhoods desirable and some not. Such factors are not typically controlled by home owners, urban designers, town planners, real estate

**Table 3**  
Sustainable, liveable and resilient features of the home derived from the literature review and grouped by feature type.

Home features by feature type		
Building design		
<ul style="list-style-type: none"><li>• is easy to extend or subdivide/downsize</li><li>• has plenty of glass windows</li><li>• has a good view</li><li>• oriented to receive prevailing breezes</li><li>• is resilient to severe storms</li><li>• has a high ceiling that allows ample natural lighting and cross ventilation</li></ul>	<ul style="list-style-type: none"><li>• has a green roof (i.e. grass growing on the roof)</li><li>• has a green wall (i.e. plants growing on the wall)</li><li>• harnesses the natural sunlight for lighting</li><li>• has walls that absorb sound to avoid noise pollution</li><li>• harnesses the natural sunlight for heating</li></ul>	
Construction material		
<ul style="list-style-type: none"><li>• is built with sustainable construction materials</li><li>• uses recycled material for construction</li><li>• is built with minimal impact on the environment</li></ul>	<ul style="list-style-type: none"><li>• uses construction material with less embodied carbon</li><li>• uses certified environmentally-friendly materials</li></ul>	
Landscaping		
<ul style="list-style-type: none"><li>• has a lot of lawn</li><li>• has plants that offer shade</li></ul>	<ul style="list-style-type: none"><li>• has plants that act as windbreaks</li><li>• a lot of plants in the garden</li></ul>	
Lifestyle & comfort		
<ul style="list-style-type: none"><li>• offers an exciting lifestyle</li><li>• is close to where I work</li><li>• offers a vibrant lifestyle</li><li>• offers a relaxed lifestyle</li></ul>	<ul style="list-style-type: none"><li>• shows that I am an environmentally responsible person</li><li>• caters for weak, elderly or disabled people</li><li>• stays cool in the summer without the use of air conditioning</li><li>• stays warm in the winter without the use of heating</li></ul>	
Green technology		
<ul style="list-style-type: none"><li>• has a rainwater tank</li><li>• has an energy efficiency rating</li></ul>	<ul style="list-style-type: none"><li>• uses solar energy (rooftop panels) as the main power source</li><li>• has a high-tech facility to regulate my energy and water consumption</li></ul>	
Economic		
<ul style="list-style-type: none"><li>• will increase in value</li><li>• is affordable</li></ul>	<ul style="list-style-type: none"><li>• saves on future electricity bills thanks to green features</li><li>• saves on future water bills thanks to green features</li></ul>	<ul style="list-style-type: none"><li>• is cheap and easy to maintain</li><li>• fetches higher rental values</li></ul>

developers, or policy makers, so we have not considered them in the current study.

3. Method

A survey of Canberra residents was conducted by the CSIRO in November 2015 to ascertain people’s preferences for characteristics of sustainable, liveable and resilient neighbourhoods and homes. A total of n = 300 residents completed the survey.

3.1. Study site

The study site covers the urban areas of the Australian Capital Territory (ACT), known as Canberra (see Fig. 2). Canberra is the capital city of Australia. The ACT covers an area of around 236,000 ha (Australian Burea of Statistics, 2013) but over half of the total area has been preserved as parks and nature reserves (VisitCanberra, 2016). The population of Canberra is around 380,000, consisting of approximately 49% male – 51% female (Australian Burea of Statistics, 2013). The median age of Canberra residents is 34.6, and according to the 2011 Census, the percentage of Canberra residents with at least an undergraduate degree is 30%. The average weekly earnings of a full time adult worker in the ACT is \$1715, the highest in Australia, based on November 2015 statistics (Australian Burea of Statistics, 2015).

Canberra was chosen as the study site because a new suburb of Canberra has been earmarked as a ‘sustainable suburb’ (see <https://gin-ninderraproject.com.au> for more information of the study site and its location). It is therefore important to understand how Canberra residents currently evaluate sustainable, liveable and resilient features of the neighbourhood and home.

3.2. Survey design

The survey consisted of three parts. The first part of the survey contained questions regarding people’s property buying history and intention. Participants were asked whether they have bought a home in the last 12 months, and whether they were considering buying a home in the next five years. These two questions allow us to test for differences in preferences for neighbourhood and home characteristics between people who own a home, people buying a home, and those who neither own nor are buying a home.

The second part of the survey consisted of questions relating to features of the neighbourhood and home. For this part of the survey, we first asked participants to think about whether they were going to respond to the survey questions in the capacity of an owner-occupier or an investor, because we hypothesize that these two buying intentions will affect preferences for features of the neighbourhood and home. Subsequently, we presented survey participants with 67 neighbourhood

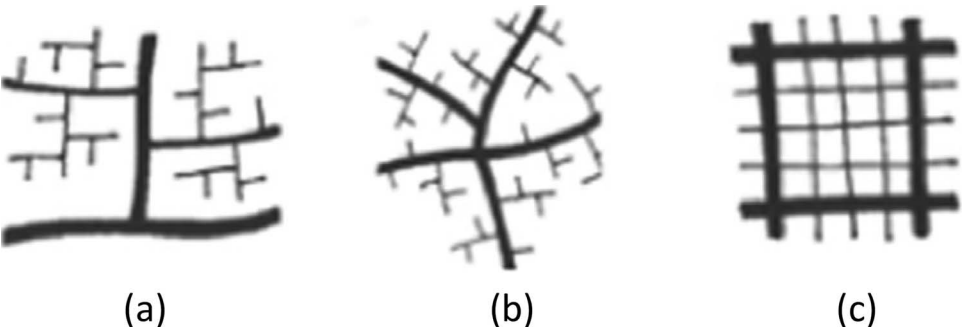


Fig. 1. (a) and (b) are tree-like street design. (c) is a gridded street design (Marshall et al., 2014).

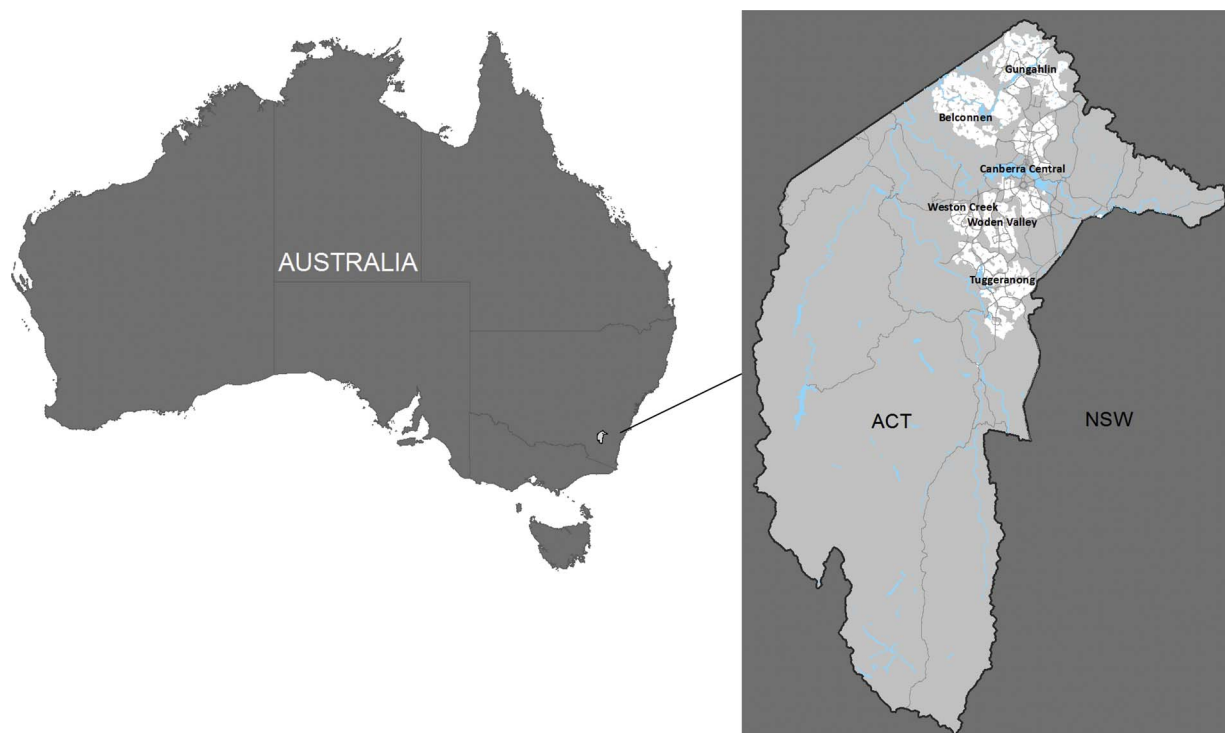


Fig. 2. Map of the ACT Survey design.

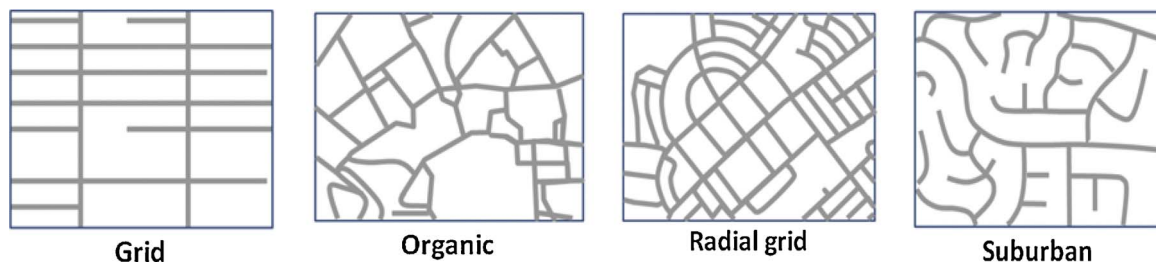


Fig. 3. Street designs presented to survey participants (based on Marshall et al., 2014).

features and 38 features of the home. Participants were asked to indicate on a seven-point scale (1 = not at all important; 7 = extremely important), how important each of the following aspects of the neighbourhood is to them if they were to buy a new property. We also asked participants to rank the most preferred street design, which include grid, organic, radial grid, and suburban (see Fig. 3). The objective of including a street design network is to find out whether Canberra residents are more likely to choose a street design that could lead to less driving and better health outcomes.

The third part of the survey consisted of demographic questions, home ownership questions (e.g. paying off mortgage, renting, or own outright), and sustainable behaviour questions (e.g. ownership of rainwater tank, greywater system, solar panels, and subscription of an electricity plan sourced from renewable energy called 'Greenchoice'). It is hypothesized that preferences for sustainable, liveable and resilient features of the neighbourhood and home will also vary with socioeconomic circumstances and environmental attitudes (using sustainable technology purchasing behaviour as a proxy for environmental attitudes)

### 3.3. Participant recruitment

Participants were recruited through an online research panel. Respondents were recruited with the aim to best represent the age and

gender distribution of Canberra, to maximize representativeness of the sample to the population of Canberra. The recruitment process also aimed at capturing respondents from as many suburbs of Canberra as possible. The invitation to the survey was sent via email to a random subset of participants in the panel. Participants were selected in a manner that ensures representativeness of Canberra residents based on the distribution of age, income, gender and postcode. The objective of the survey was not mentioned in the invitation email in order to avoid self-selection bias. Participants who were interested in completing the survey were sent to the survey page where information was presented about the survey objective, how long the survey would take, how the data would be used, and the survey's ethical clearance. Participants were also informed that they would receive 'reward points' through the online research company for their efforts. Before proceeding to the survey, participants were asked to provide their consent to take part in the survey by checking the appropriate box. The survey company kept a record of how many participants had completed the survey. Reminder emails were sent out to invited participants until the target number of participants was reached. Once the target number of participants was reached, the survey was closed to prevent other invited participants from completing the survey. Due to this process, it was difficult to determine the exact response rate as there may be other participants who wanted to complete the survey after it was closed.

**Table 4**  
Summary statistics of sample characteristics.

Sample characteristics (Sample size n = 300)	% of sample
Buying intention	
- Owner-occupier	88%
- Investor	12%
Gender	
- Male	44%
- Female	55%
- Not otherwise stated	1%
Income	
- \$2000 or more per week (\$104,000 a year)	11%
- \$1600 – \$1999 a week (\$83,200 – \$103,999 a year)	10%
- \$1300 – \$1599 a week (\$67,600 – \$83,199 a year)	14%
- \$1000 – \$1299 a week (\$52,000 – \$67,599 a year)	15%
- \$800 – \$999 a week (\$41,600 – \$51,999 a year)	9%
- \$600 – \$799 a week (\$32,000 – \$41,599 a year)	6%
- \$400 – \$599 a week (\$20,800 – \$31,199 a year)	9%
- \$250 – \$399 a week (\$13,000 – \$20,799 a year)	4%
- \$150 – \$249 a week (\$7800 – \$12,999 a year)	4%
- \$1– \$149 a week (\$1 – \$7799 a year)	1%
- nil income	3%
- Prefer not to respond	13%
Age	
- 18–29 years	18%
- 30–44 years	29%
- 45–54 years	20%
- 55–64 years	18%
- 65–74 years	13%
- 75 years and over	2%
Education	
- some of primary school	0%
- completed primary school	1%
- some of high school/tertiary school	11%
- completed tertiary school	10%
- some of trade/vocational qualification	4%
- completed trade/vocational qualification	12%
- some of undergraduate degree	7%
- completed undergraduate degree	28%
- some of postgraduate qualification	5%
- completed postgraduate qualification	20%
- Prefer not to respond	2%
Green technology behaviour	
- Ownership of solar panels	15%
- Ownership of rainwater tanks	21%
- Ownership of greywater systems	9%
- On Greenchoice electricity plan	10%

### 3.4. Analysis method

In addition to mean ratings of the overall sample, we also present key findings around the features of the neighbourhood and home that have been ranked differently depending on socio-economic circumstances and intention to buy. We performed a pooled variance *t*-test of differences between sample means at significance level of  $\alpha=0.05$  (Levine, Stephan, Krehbiel, & Berenson, 2001) to examine group differences.

## 4. Results

### 4.1. Descriptive statistics of demographic and sustainable behaviour

In order to differentiate preferences of people buying as an investor versus people buying as an owner occupier, participants were asked at the beginning of the survey whether they were rating the characteristics of neighbourhoods and houses from the perspective of an owner occupier or investor. The majority of participants (88%) stated that they have responded as if they were buying as an owner occupier, and 12% answered as if they were buying as an investor. The sample consisted of 44% male and 55% female. Around 56% of the sample earned \$52,000 or more per year, and approximately 54% have completed an undergraduate degree. The average age of the sample was 46 years (see

Table 4 for descriptive statistics).

A small proportion of households currently owns green technology – rainwater tanks being adopted by 21% of the sample, solar panels by 15% of the sample, and greywater systems by 9% of the sample. Note that these are not mutually exclusive groups, and some respondents own more than one type of green technology. In fact, 5 participants stated that they own all the above technologies and are on the Greenchoice energy plan. In any case, only a small group of people (10% of sample) indicated that they are on the Greenchoice electricity plan. These people pay extra on their electricity bills to ensure that they contribute less to greenhouse gas emissions through their consumption of electricity.

### 4.2. Preferences for features of the neighbourhood and home

We now present highlights from the survey that may inform the design of future neighbourhoods and homes.

Fig. 4 presents how preferences for neighbourhood characteristics are ranked by the sample of Canberra residents. Neighbourhood safety was rated as the most important feature of the neighbourhood ( $M = 6.11$ ,  $SD = 1.18$ ) followed by cleanliness ( $M = 6.02$ ,  $SD = 0.96$ ). The least important feature was shared bins rather than bins for individual homes (rating = 2.96,  $SD = 1.70$ ) and the second least important feature was a diversity of religious organizations (rating = 3.13,  $SD = 1.80$ ). Ratings of importance by each feature type were as follows: employment opportunities ( $M = 4.61$ ,  $SD = 1.74$ ) in the neighbourhood for the Economic feature type; cleanliness ( $M = 6.02$ ,  $SD = 0.96$ ) for the Healthy neighbourhood feature type; choices of affordable housing ( $M = 5.20$ ,  $SD = 1.44$ ) for the Social feature type; low crime rate ( $M = 6.11$ ,  $SD = 1.18$ ) for the Safety feature type; access to local broadcasting signals ( $M = 5.76$ ,  $SD = 1.37$ ) such as free TV and radio for the Community feature; and good quality road surfaces ( $M = 5.74$ ,  $SD = 1.10$ ) for the Accessibility and connectedness features.

With regards to home design, Fig. 5 presents the mean ratings and standard deviations of preferences for various features of the home by feature type.

The most important characteristic of the home was that it had to be affordable ( $M = 6.12$ ,  $SD = 1.03$ ). The next most important characteristics of the home were related to lifestyle and comfort i.e. the home stays warm in the winter without the use of heating ( $M = 6.01$ ,  $SD = 1.02$ ) and stays cool in the summer without the use of air conditioning ( $M = 5.99$ ,  $SD = 0.99$ ). The least important features were related to green facades, such as green walls ( $M = 3.82$ ,  $SD = 1.72$ ) and green roofs ( $M = 3.43$ ,  $SD = 1.86$ ), and a lot of lawn ( $M = 3.77$ ,  $SD = 1.69$ ).

#### 4.2.1. Differences by buying intention

Preferences for neighbourhood characteristics appear to be relatively similar between people who plan to buy a home as owner occupier versus investors who plan to buy the home as investment property (see Table 5). Both groups rated low crime rate and cleanliness as the two most important neighbourhood features. On the other hand, the two least important features for owner-occupiers were a diversity of religious organisations in the neighbourhood, and shared bins rather than bins for each home. As for investors, the two least important features were museums, and shared bins rather than bins for each home. Having said that, there are a few noticeable differences in preferences between these two groups of buyers. A test of the differences between the two samples revealed that investors rated the following neighbourhood characteristics significantly higher ( $\alpha=0.05$  level of significance) than owner occupiers: children's playground, childcare facilities, and off-road cycle paths. Owner-occupiers rated the following neighbourhood characteristics significantly higher: access to local broadcasting signals such as free TV and radio, street trees, and fortnightly garbage collection.

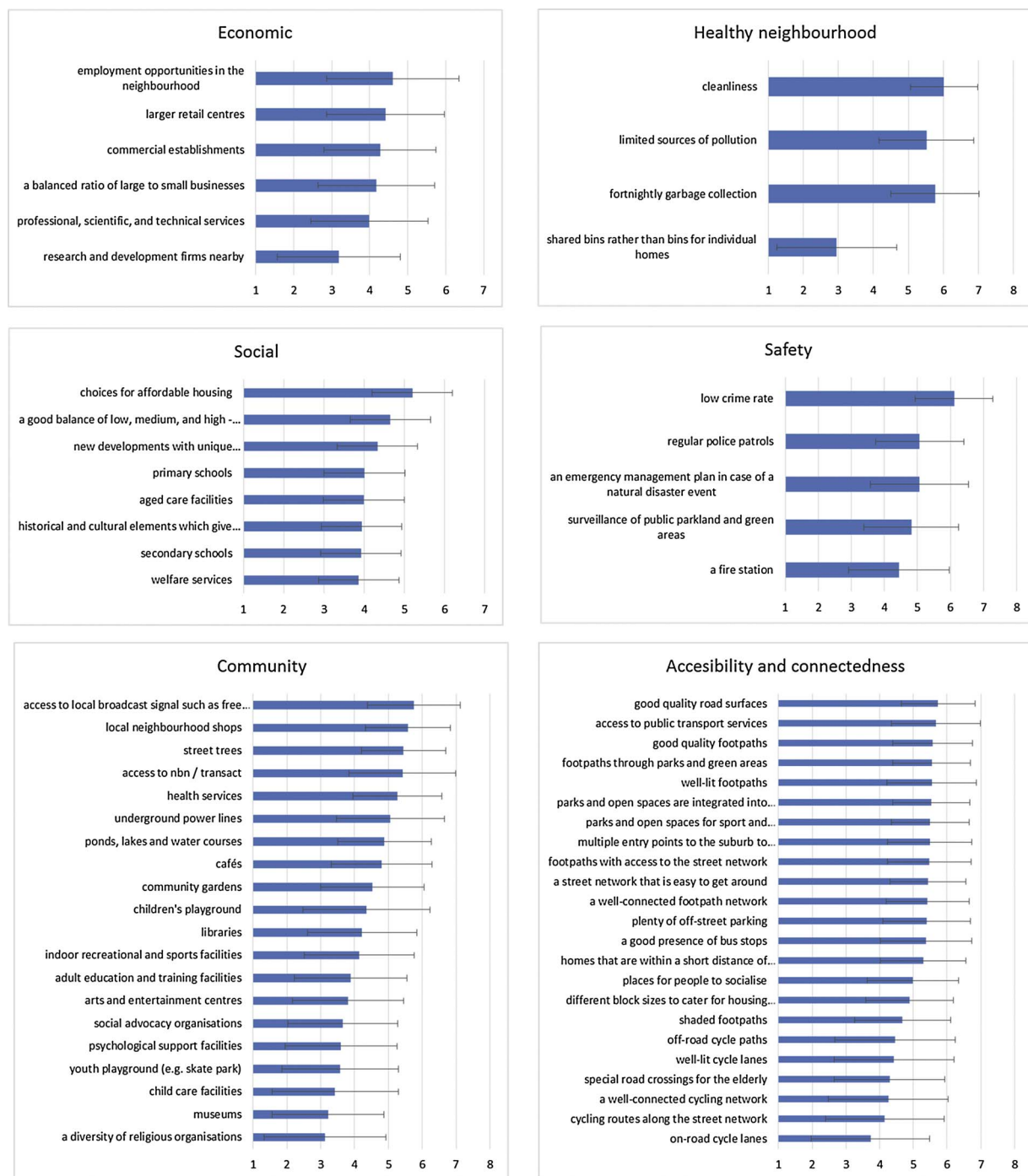


Fig. 4. Mean rating (M) and standard deviation (SD) of preferences for neighbourhood features by feature type (1 = Not all important; 7 = Extremely important).

With regards to features of the home (see Table 5), the preference ratings between these two groups were similar to the overall sample. Investors rated 'a home that is resilient to severe storms' and 'affordability' as the two most important features. Meanwhile, owner-occupiers rated affordability and a home that stays warm in the winter without the use of heating as the two most important features. The two groups of buying intentions shared the same preferences when it comes to the least preferred features. Both groups rated green facades (e.g. green roofs, green walls and large lawns) as the least preferred features of the home. In terms of differences in preference ratings, there was only one feature where preference rating differed significantly between these two groups. Investors rated fetching higher rental values significantly higher than owner-occupiers.

#### 4.2.2. Differences by gender

Our study slightly oversampled women: 44% of the sample were male and 55% were female. Those not otherwise stated were not included in this comparison.

Both men and women rated low crime rate cleanliness as the two most important features of the neighbourhood and shared bins rather than bins for each home as the least important feature (see Table 6). Female respondents rated research and development firms nearby as the second least important feature of the neighbourhood while male respondents rated a diversity of religious as their second least preferred. In terms of differences in ratings between male and female, women rated a number of features higher than men. The three features that women rated much higher than men were libraries, an emergency

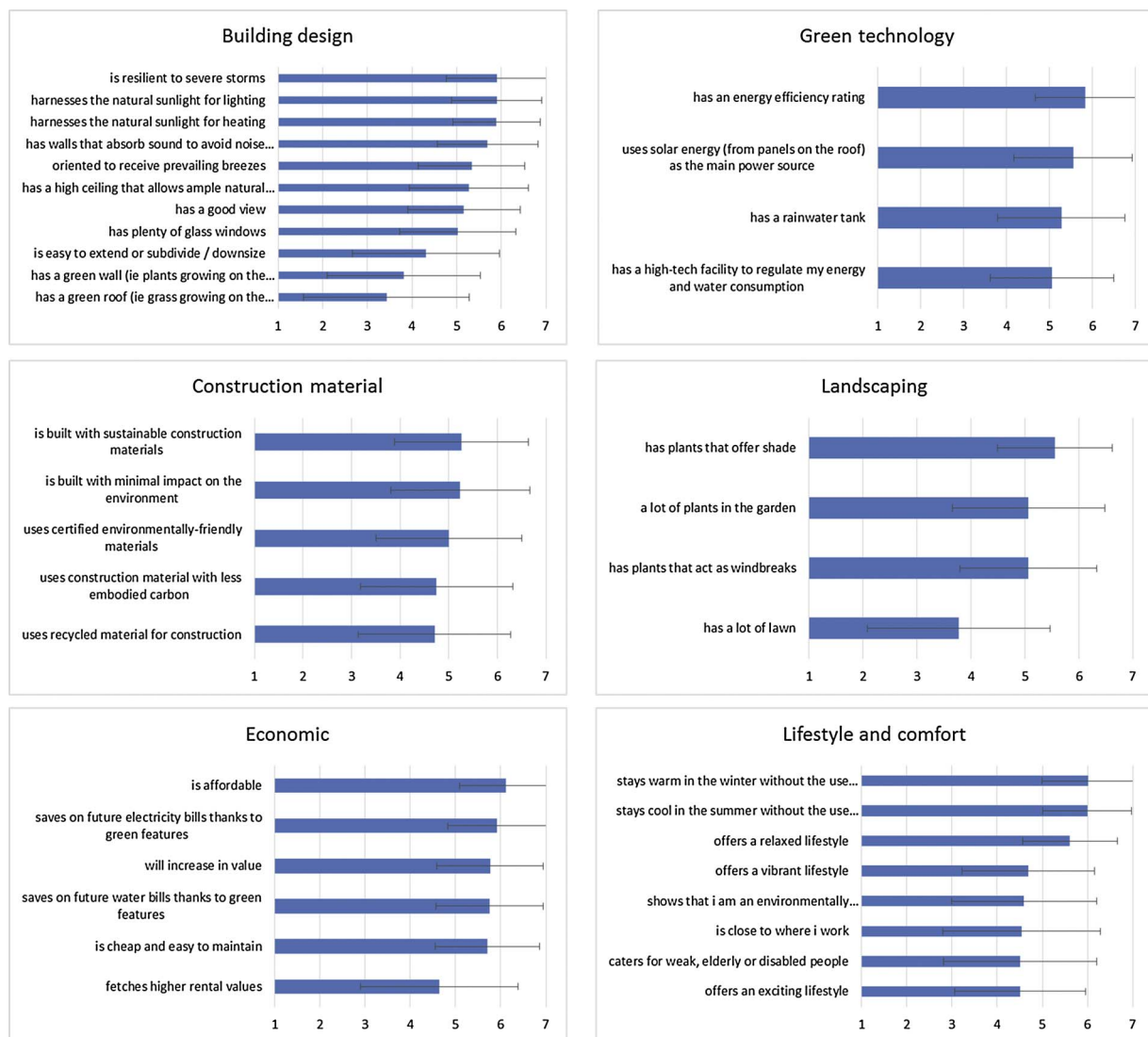


Fig. 5. Mean rating (and standard deviation) of preferences for features of the home by feature type (1 = Not all important; 7 = Extremely important).

management plan in case of a natural disaster event, and well-lit footpaths. There were no features that men rated significantly higher than women. Other features that women rated higher than men (but not reported in this table include surveillance of public parkland and green areas and health services).

In terms of the features of the home (see Table 6), women rated affordability as the most important feature of the home, while men rated a home that stays cool in the summer without the use of air conditioning as the most the important feature, which was the second most important feature for women. For men, the second most important feature was a home that stays warm in the winter without the use of heating. Men rated affordability as the third most important feature. Both genders agreed on the two least important features which were green roofs, green walls, and a lot of lawn. In terms of differences in the ratings between these two groups, there were 17 features of the home which women rated as significantly more important (i.e. given higher rating score) than men. The three features with the biggest rating difference between the two gender groups were a home that uses recycled material for construction, is built with minimal impact on the environment, and is affordable.

#### 4.2.3. Differences by income

In this sample, approximately 44% of the sample earned less than \$52,000/year of personal income. For simplicity of comparison and

presentation, we therefore split the sample into lower half (less than \$52,000/year) and upper half (\$52,000/year or greater) income bracket. Those who preferred not to respond were not included in this comparison.

In terms of neighbourhood features (see Table 7), the two most important features for both income groups were also cleanliness and safety (i.e. low crime rate). The two income groups rated shared bins rather than bins for each home as the least important feature of the neighbourhood. However, the second least important feature for the lower income group was museums while for the higher income group it was research and development firms nearby. Despite their similarities in preference ratings for the most and least preferred features of the neighbourhood, these two groups differ in preferences on a number of neighbourhood features. The lower income group rated a number of neighbourhood features significantly higher than the higher income group. The three main ones were: a good balance of low, medium, and high – cost housing, street trees, and community gardens. The higher income group rated access to NBN/Transact, i.e. high-speed internet, higher than the lower income group.

As for features of the home (see Table 7), the higher income group rated affordability and the ability to increase in value as the two most important features of the home. The lower income group also rated affordability as the most important feature, but rated a home that stays warm in the winter without the use of heating as the second most

**Table 5**  
Ratings of neighbourhood and house features by buying intention.

	Investor		Owner-occupier	
	M	SD	M	SD
Neighbourhood features				
low crime rate	6.27	0.96	6.09	1.21
cleanliness	5.97	1.01	6.03	0.96
fortnightly garbage collection	5.38	1.57	5.81	1.20
access to local broadcast signal such as free tv and radio	5.32	1.58	5.82	1.33
street trees	5.05	1.35	5.51	1.23
off-road cycle paths	5.05	1.76	4.38	1.78
children's playground	4.95	1.63	4.27	1.89
child care facilities	4.08	1.75	3.33	1.86
a diversity of religious organisations	3.14	1.72	3.13	1.81
museums	3.00	1.63	3.25	1.65
shared bins rather than bins for individual homes	2.86	1.78	2.97	1.70
House features				
is resilient to severe storms	5.95	1.18	5.91	1.14
is affordable	5.92	1.01	6.14	1.03
stays warm in the winter without the use of heating	5.86	1.06	6.03	1.02
fetches higher rental values	5.78	1.11	4.47	1.76
has a lot of lawn	3.89	1.76	3.75	1.69
has a green wall (i.e. plants grown in the wall)	3.78	1.75	3.83	1.71
has a green roof (i.e. grass growing on the roof)	3.59	1.92	3.41	1.85

**Table 6**  
Ratings of neighbourhood and house features by gender.

	Female		Male	
	M	SD	M	SD
Neighbourhood features				
low crime rate	6.22	1.14	5.96	1.23
cleanliness	6.16	0.95	5.84	0.96
well-lit footpaths	5.75	1.22	5.30	1.42
libraries	4.45	1.70	3.91	1.43
an emergency management plan in case of a natural disaster event	5.28	1.41	4.77	1.54
research and development firms nearby	3.23	1.64	3.14	1.59
a diversity of religious organisations	3.27	1.82	2.93	1.76
shared bins rather than bins for individual homes	3.08	1.73	2.75	1.63
House features				
is affordable	6.35	0.86	5.81	1.15
stays warm in the winter without the use of heating	6.12	1.04	5.87	0.99
stays cool in the summer without the use of air conditioning	6.07	1.07	5.89	0.87
is built with minimal impact on the environment	5.48	1.36	4.92	1.47
uses recycled material for construction	4.97	1.50	4.35	1.59
has a green wall (i.e. plants grown in the wall)	3.90	1.74	3.70	1.69
has a lot of lawn	3.81	1.75	3.71	1.64
has a green roof (i.e. grass growing on the roof)	3.52	1.90	3.30	1.81

important feature. The least important features for both income groups were the same as the overall sample – green facades. With regards to significant differences in ratings between the two income groups, the lower income group rated a number of features significantly higher. The three main ones were: a home that uses construction material with less embodied carbon, uses recycled material for construction, and caters for the weak, elderly or disabled people. The higher income group rated only one feature higher than the lower income group and that was the ability to increase in value.

#### 4.2.4. Differences by age

We split the sample approximately in half by age, where the lower age group consists of those younger than 45 years old (47% of the sample) and the higher age group are those age 45 years or over (53% of the sample).

Both age groups rated cleanliness and low crime rate as the two

**Table 7**  
Ratings of neighbourhood and house features by income.

	Lower half		Upper half	
	M	SD	M	SD
Neighbourhood features				
low crime rate	6.11	1.18	5.99	0.91
cleanliness	6.12	1.01	6.11	1.12
shared bins rather than bins for individual homes	3.05	1.69	2.82	1.71
museums	3.31	1.76	2.99	1.62
research and development firms nearby	3.42	1.69	2.93	1.58
a good balance of low, medium, and high – cost housing	4.99	1.42	4.39	1.43
street trees	5.52	1.37	5.48	1.04
community gardens	4.61	1.57	4.37	1.50
access to NBN/transact	5.18	1.68	5.60	1.49
House features				
is affordable	6.03	1.01	6.31	0.96
will increase in value	5.95	1.01	5.63	1.32
stays warm in the winter without the use of heating	5.94	1.07	6.15	0.95
has a green wall (i.e. plants grown in the wall)	3.71	1.73	3.99	1.72
has a lot of lawn	3.67	1.74	3.91	1.69
has a green roof (i.e. grass growing on the roof)	3.24	1.80	3.53	1.95
uses construction material with less embodied carbon	4.51	1.66	4.96	1.48
uses recycled material for construction	4.49	1.65	4.94	1.47
caters for weak, elderly or disabled people	4.27	1.69	4.72	1.71

**Table 8**  
Ratings of neighbourhood and house features by age.

	< 45		≥ 45	
	M	SD	M	SD
Neighbourhood features				
cleanliness	6.14	0.89	5.89	1.03
low crime rate	6.25	1.04	5.96	1.31
shared bins rather than bins for individual homes	2.66	1.60	3.28	1.76
child care facilities	2.89	1.79	4.02	1.76
museums	3.13	1.66	3.31	1.64
underground power lines	5.53	1.48	4.53	1.55
aged care facilities	4.42	1.80	3.52	1.59
fortnightly garbage collection	6.03	1.16	5.46	1.30
primary schools	3.46	2.09	4.63	1.73
youth playground (e.g. skate park)	3.15	1.68	4.04	1.65
children's playground	3.97	1.94	4.77	1.71
secondary schools	3.54	1.99	4.35	1.66
House features				
is affordable	6.26	0.91	5.96	1.14
is resilient to severe storms	6.20	0.91	5.59	1.28
stays cool in the summer without the use of air conditioning	6.13	0.90	5.83	1.06
stays warm in the winter without the use of heating	6.20	0.92	5.81	1.09
has a green roof (i.e. grass growing on the roof)	3.20	1.87	3.70	1.82
caters for weak, elderly or disabled people	4.78	1.68	4.20	1.67
is close to where i work	4.05	1.85	5.08	1.44
fetches higher rental values	4.35	1.90	4.95	1.50
offers an exciting lifestyle	4.23	1.51	4.80	1.31

most important features of the neighbourhood and shared bins rather than bins for each home as the least important feature of the neighbourhood (see Table 8). However, those who were 45 years or over rated childcare facilities as the second least important feature while those who were under 45 rated museums as the second least important feature. The two groups differed in their preference ratings for many neighbourhood features. Altogether there were 28 features where the ratings of these two groups were significantly different. Most interestingly, those aged 45 or over rated the following three features significantly higher than those aged under 45: underground power lines, aged care facilities, and fortnightly garbage collection. Those aged under 45 rated the following features significantly higher than those aged 45 or over: primary schools, child care facilities, youth

**Table 9**  
Ratings of neighbourhood features by education level.

	< undergraduate degree		≥ graduate degree	
	M	SD	M	SD
Neighbourhood features				
cleanliness	5.98	0.99	6.10	0.93
low crime rate	6.07	1.17	6.22	1.10
shared bins rather than bins for individual homes	3.13	1.67	2.75	1.74
choices for affordable housing	5.04	1.55	5.38	1.32
off-road cycle paths	4.83	1.68	4.05	1.85
on-road cycle lanes	4.04	1.66	3.34	1.81
cycling routes along the street network	4.44	1.69	3.80	1.80
a well-connected cycling network	4.56	1.72	3.94	1.79
House features				
is affordable	6.06	1.00	6.21	1.04
stays warm in the winter without the use of heating	6.04	1.04	6.03	0.98
has a lot of lawn	3.80	1.72	3.73	1.69
has a green wall (i.e. plants grown in the wall)	3.98	1.66	3.61	1.79
has a green roof (i.e. grass growing on the roof)	3.60	1.79	3.24	1.94
shows that I am an environmentally responsible person	4.84	1.53	4.31	1.67
is built with minimal impact on the environment	5.42	1.24	5.05	1.64
uses certified environmentally-friendly materials	5.18	1.35	4.81	1.67
shows that I am an environmentally responsible person	4.84	1.53	4.31	1.67

playground, children's playground and secondary schools, all of which are related to children and schooling.

On the matter of the features of the home (see Table 8), both age groups rated affordability as the most important feature. However, those aged 45 and over rated resilience to severe storms as the second most important feature of the home, while the under 45 s rated a home that stays cool in the summer without the use of air conditioning as the second most important feature. Both age groups shared similar sentiments on the least important features. They both rated green roof as the least preferred. The two age groups differed significantly on the importance ratings of 20 features of the home. Those aged 45 and over rated homes that are resilient to severe storms, cater for the weak, elderly and disabled, and stays warm in the winter without the use of heating significantly higher than the under 45 age group. Those under 45 rated the following features significantly higher than the 45 and over age group: a home that is close to where they work, fetches higher rental value, and offers an exciting lifestyle.

#### 4.2.5. Differences by education

The sample was split approximately in half by level of education. Around 54% of the sample have completed an undergraduate degree, and the remaining 46% have not. Those who preferred not to respond were not included in this comparison.

As shown in Table 9, preference ratings by education remain consistent in that the two most highly rated features were cleanliness and low crime rate and the least preferred feature was shared bins rather than bins for each home. Education level also presented significant differences in a number of neighbourhood features. Those who have not completed an undergraduate degree rated choices for affordable housing significantly higher than those with an undergraduate degree. Participants who have completed an undergraduate degree rated the following three features significantly higher than those who have not

**Table 10**  
Ratings of neighbourhood and house features by green technology behaviour.

	Green technology behaviour		Not green technology behaviour	
	M	SD	M	SD
Neighbourhood features				
low crime rate	6.12	1.22	6.08	1.11
cleanliness	6.06	0.96	5.94	0.96
shared bins rather than bins for individual homes	2.87	1.66	3.12	1.77
access to NBN/transact	5.27	1.61	5.67	1.48
regular police patrols	5.20	1.36	4.82	1.26
homes that are within a short distance of public amenities	5.41	1.23	5.07	1.31
health services	5.37	1.33	5.05	1.27
House features				
is affordable	6.07	1.05	6.14	1.02
stays cool in the summer without the use of air conditioning	6.00	0.98	5.98	1.00
stays warm in the winter without the use of heating	5.91	1.05	6.07	1.01
has a lot of lawn	3.58	1.68	3.88	1.70
has a green wall (i.e. plants grown in the wall)	3.78	1.79	3.84	1.68
has a green roof (i.e. grass growing on the roof)	3.45	1.81	3.42	1.89
will increase in value	5.57	1.23	5.87	1.13
is cheap and easy to maintain	5.39	1.18	5.87	1.11

completed an undergraduate degree: off-road and on-road cycle paths, cycling routes along the street network, and a well-connected cycling network.

With regards to features of the home (see Table 9), both groups rated affordability as the most important feature of the home, followed by a home that stays warm in the winter without the use of heating. Both groups also share the same least preferences ratings which were related to green facades i.e. green roofs, green walls and large lawns. There were several features where those who have completed an undergraduate degree rated significantly higher than those who have not completed an undergraduate degree. The three that with the highest difference in ratings were: the home shows that they are an environmentally responsible person, is built with minimal impact on the environment, and uses certified environmentally-friendly materials.

#### 4.2.6. Differences by green technology behaviour

We grouped respondents who indicated that they have one or more of the following green behaviours – solar panels, greywater system, rainwater tank, and Greenchoice electricity plan – into the green technology behaviour group (35% of the sample), and those who have none of these green behaviours in the not green technology behaviour group (65% of the sample).

As presented in Table 10, these two green behaviour groups also rated cleanliness and low crime rate as the two most important features and shared bins rather than bins for each home as the least important feature. Those with green technology behaviour rated well-lit cycle lanes and access to NBN/Transact significantly higher than those who were not in the green technology behaviour group. On the other hand, those who were not in the green technology groups rated the following three features significantly higher than those in the green technology behaviour group: regular police petrol, homes that are within a short distance to public amenities, and health services.

In terms of features for the home (see Table 10) both groups rated affordability as the most important feature, but those with green technology behaviour rated a home that stays cool in the summer with the use of air conditioning as the second highest, while those without green technology group rated a home that stays warm in the winter without the use of heating as their second highest. And similar to the

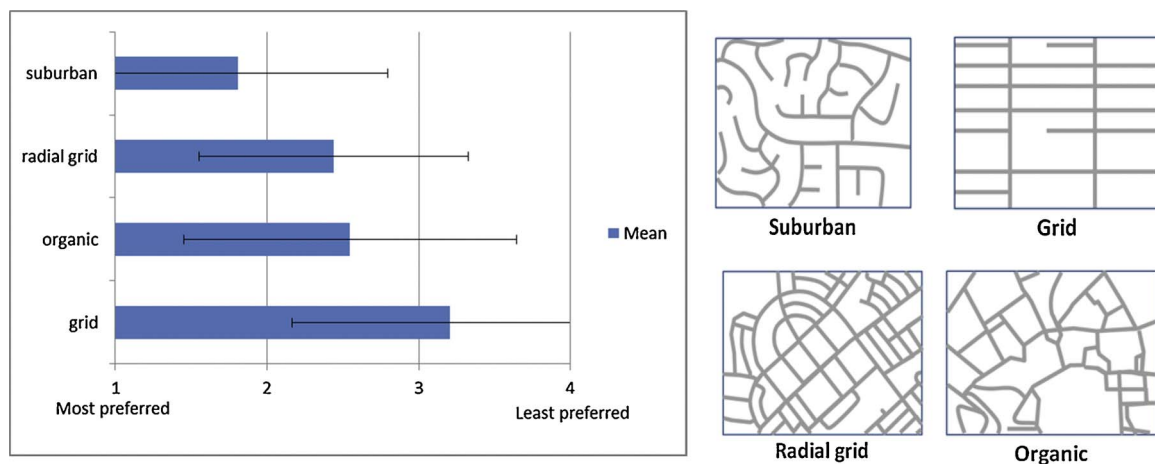


Fig. 6. Preferences for neighbourhood road network design.

rest of the sample, both groups rated green facades as the two least important features of the home. There were two features where those without green technology behaviour rated significantly higher than those with green technology behaviour. These two features were a home that will increase in value and is cheap and easy to maintain.

#### 4.3. Preferences for neighbourhood street design

Lastly, we examined preferences for neighbourhood street design. The bar chart in Fig. 6 presents average ranking score for each of the four neighbourhood street designs. A low score indicates that the design has been chosen as the most preferred option. The most preferred option is the ‘suburban’ design, with a mean rating score of 1.81 (SD = 0.99), followed by ‘radial grid’ (M = 2.44, SD = 0.89), and organic (M = 2.55, SD = 1.10). The least preferred design is the grid design (M = 3.2, SD = 1.04). In terms of percentages of total respondents, the majority of respondents (52%) preferred the suburban design, followed by 16% for the radial grid design, and 21% and 11% for the organic and grid design, respectively.

We then analysed whether preference for street design is consistent with ratings of two neighbourhood design statements, which are “a street network that is easy to get around” and “multiple entry points to the suburb to negate traffic congestions”. *A priori* expectation is that to create privacy, the suburban street design is intended to be harder to get around and have fewer access points, therefore, people who prefer a suburban design would give low ratings to these two statements. On the other hand, people who prefer a grid design, would give high ratings to these two statements. A one-way ANOVA between groups, viz., grouped by preference for grid, organic, radial grid or suburban design, was conducted to compare response rating for each of the two statements. We found no significant difference in ratings between groups for both statements, where ANOVA results for statement 1 “a street network that is easy to get around” was [ $F(3,299) = 1.17, p = 0.32$ ] and for statement 2 “multiple entry points to the suburb to negate traffic congestions” was [ $F(3,299) = 0.38, p = 0.77$ ]. In other words, those who prefer grid design or suburban design rated these two statements more or less the same.

## 5. Discussion

We discuss a summary of key findings and insights from our findings, with references to past published literature, to help inform the design of future neighbourhoods and homes, particularly ones with a sustainability focus.

It is interesting to observe that of all the 38 home features and 67 neighbourhood features we asked participants to rate, not one of the home features and only five of the neighbourhood features (research

and development firms nearby, shared bins rather than bins for individual homes, museums, and a diversity of religious organisations) were given a mean importance rating below the absolute scale midpoint – that is, the vast majority of features are seen by participants as reasonably important considerations in buying a house. The important question for urban designers, town planners, and others then becomes what is the degree of relative importance of each of these features. A further related question, not addressed in this study, is how people trade-off one desired feature against another.

#### 5.1. Preferences for neighbourhood features

Consistent across the socio-economic groups and buying intentions considered in this analysis, Canberra residents rated safety and cleanliness as the two most important features of the neighbourhood. These two features have been shown to go hand in hand. The Crime Prevention through Environmental Design (CPTED) group in Queensland, Australia, advocated that neighbourhood street cleanliness is associated with community safety benefits (Clancey & Fisher, 2016). Along the same vein, Wood et al. (2008) found an association between neighbourhood upkeep (which included garden maintenance, street maintenance and level of cleanliness) and feelings of personal safety in a study of metropolitan suburbs in Perth, Western Australia. Hence, in any type of neighbourhood design, it is important to ensure a safe and clean environment above all features offered, even sustainable ones.

On the matter of safety, female participants clearly rated health and safety features, such as surveillance of public parkland and green areas, an emergency management plan in case of natural disaster events, and health services, significantly higher than male participants did. This finding is supported by other studies including a review of gender attitude differences towards environmental risks conducted by Davidson and Freudenburg (1996). Davidson and Freudenburg concluded that at least 16 previously published studies on risk perception supported the finding that environmental risk was more salient to women than to men.

Although owner-occupiers and investors rate neighbourhood characteristics similarly, there were several neighbourhood features where investors ranked the features higher than owner-occupiers. These features include children’s playground, childcare facilities, and off-road cycle paths. One can interpret these results by suggesting that investors are looking for neighbourhood characteristics that would attract young families with children.

#### 5.2. Preferences for features of the home

As for features of the home, affordability was the most important feature, followed by homes that stay cool in the summer and warm in

the winter without the need of heating or cooling. Arguably, these two lifestyle features could both be manifestations of affordability since they directly relate to energy cost saving. In any case, in the effort to try and achieve energy savings, building designers need to be cognisant of the level of comfort sustainable designs offer. In a post-occupancy survey of sustainable homes in UK, occupants expressed their dissatisfaction with sustainable homes in that they tend to be too hot in the summer and too cold in the winter (Leaman and Bordass, 2007). Furthermore, even if the sustainable design were able to achieve the level of thermal comfort, occupants complain that the homes lacked ventilation or felt ‘stuffy’. Leaman and Bordass (2007) warned that it was better for designers to remove sources of dissatisfaction rather than providing more features hoping that the occupants might like them. On the matter of dissatisfaction, we found that green facades such as green walls, green roofs and large lawns are the least preferred features of the home, despite the benefits of green roofs helping to mitigate storm-water run-off (see Castiglia Feitosa and Wilkinson, 2016 for benefits of green roofs). People may perceive that the personal costs and time associated with the upkeep of green facades are too high for the benefits gained.

In the analysis of group differences, we found no significant differences in ratings between investors and owner-occupiers except on the feature ‘fetching higher rental values’. Perhaps one way to interpret the absence of difference would be that everyone seeks the same set of features, and will strive to get as many of those features as they are able within affordability constraints. For this reason, affordability was rated as one of the most important features of the home by both types of buyers.

Our survey revealed that about one-third of participants indicated that they own at least one piece of green technology. Hence, there is potential for more adoption of green technology in the future. Considering the prices of sustainable technology, such as solar panels have come down significantly in the past 10 years, there is a good opportunity for home owners to buy solar panels to safe guard themselves against the ever increasing electricity price.

### 5.3. Preferences for neighbourhood street design

The preference for the ‘suburban’ design (as shown in Fig. 3) may be a reflection of the status quo bias since many suburbs in Canberra (and the rest of Australia) follow this design. This type of design is described as winding and poorly connected roads. This design may create a sense of privacy and deter speeding, but discourages people from walking from place to place. The grid design which, according to Marshall (20140), consists of “more compact and connected street networks with fewer lanes on the major roads” can have positive health effects which include “reduced rates of obesity, diabetes, high blood pressure, and heart disease”. This information is important for homebuyers to know because it appears from our analysis that homebuyers desire a certain level of street design connectedness, yet do not know which street design is best for achieving that outcome. Educational programs about the benefits of the grid design is required to promote preference change, otherwise, given the findings presented here, people are choosing what is not best for their long-term health.

## 6. Conclusion

Cities can be prepared for future environmental, social, and economic shocks and stresses by being more sustainable and resilient to these changes. At the same time, cities should endeavour to reduce resource use and environmental footprint, while improving people’s quality of life, health and well-being. In order to do so, it is important to have a good understanding of people’s preferences for future sustainable neighbourhood and home designs.

In this paper, we extracted from the literature a set of features of homes and neighbourhoods that might help make them sustainable,

resilient, and liveable. We then assessed how important each of these features is to a sample of residents from Canberra, Australia. Almost all were judged to be at least somewhat important.

We compared preference ratings of these features by socio-economic factors – including buying intentions, demographic and environmental behaviour, and found very little differences across these groups. Most people, at least in Canberra, largely agree on what sustainability features make a home and a neighbourhood desirable.

Findings from this study could be used to inform sustainable building and suburb development guidelines in Canberra, or in other parts of the world, including how streets should be designed, how well walking and cycling paths should be connected to other roads, the importance of safety and cleanliness, and the balance between private and public green space. The information could also be used by realtors to design targeted communication messages to clients of varying demographic characteristics.

Implications of these findings at the societal level is that the status quo bias may still be strong, as evidenced by strong preference for the ‘unhealthy’ suburban street design. Even if there is a desire to buy neighbourhoods and homes that focus on sustainability, these homes should still maintain the status quo of living standards. In other words, new designs for sustainable homes and neighbourhoods will probably not be accepted by residents (and hence will become economically unviable) if they stray too far from accepted norms of design. Other studies have demonstrated that liveability trumps sustainability when it comes to willingness to buy (see Buys, Barnett, Miller, & Bailey, 2005). Policy makers need to set higher standards for building and neighbourhood designs that encompass sustainability, resilience and liveability features, without compromising on one or the other. This will require more research and innovation from the building and land development industries.

It is now important to develop research that examines how people trade-off different sustainability features of homes and neighbourhoods, to examine how features of homes interact with features of neighbourhoods, and to investigate how these sustainability features interact with broader sets of social features of neighbourhoods that are largely beyond the control of planners and developers.

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